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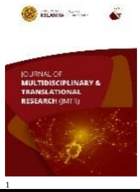

Intelligent process automation adoption: A systematic literature review and identifying research gaps for the Sri Lankan telecommunications context

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Abstract

This study systematically reviewed and synthesized the existing literature on Intelligent Process Automation (IPA) adoption, with a particular focus on identifying empirical, theoretical, methodological, and contextual gaps in the telecommunications industry, particularly in emerging economies such as Sri Lanka. A Systematic Literature Review (SLR) was conducted following PRISMA guidelines. From 192 identified articles published between 2020 and 2025 retrieved from Lens.org using the keywords "Intelligent Process Automation" and "IPA, irrelevant studies were excluded automatically and manually. The remaining 30 articles were retrieved and the content was assessed for relevance and and included in the analysis. Bibliometric and keyword co-occurrence analyses were performed using VOSviewer and Biblioshiny in RStudio to identify thematic clusters, research trends, and knowledge gaps for the 30 peer-reviewed empirical journal articles. The findings revealed two dominant thematic clusters: (1) enhancing business continuity through the evolution from Business Process Automation (BPA) to Robotic Process Automation (RPA) and IPA, and (2) accelerating digital transformation through AI-driven predictive analytics and machine learning. While IPA research shows significant annual growth (51.57%), studies are largely qualitative and concentrated in developed economies, with minimal focus on the telecommunications sector. Empirical and theory-driven quantitative studies remain limited, and contextual evidence from Sri Lanka is absent. The review is limited to articles indexed in Lens.org and published in English. The study highlights the need for theory-driven, quantitative, and industry-specific empirical research, particularly in telecommunications and developing countries. The findings guide managers and policymakers in leveraging IPA to improve operational efficiency, drive digital transformation, and ensure business continuity, while addressing adoption determinants and technological integration challenges. This study provides a comprehensive bibliometric and thematic synthesis of IPA adoption literature and uniquely identifies critical gaps in the telecommunications context, offering directions for future empirical research.

Keywords: Intelligent process automation, Robotic process automation, Digital transformation, Telecommunications industry, Business continuity

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Introduction

A business process is a group of related activities that, when finished, provide a customer with a service or product or achieve an organizational objective within a company. Business Process Management (BPM) is a multidisciplinary field that involves modelling, automation, execution, control, measurement, and optimization of business processes, systems, and people within and beyond an enterprise (Reichert & Weber, 2012) . Business Process Automation (BPA) enhances business efficiency by automating information management, team time, and execution logic, reducing costs, resources, and investment (Chakraborti et al., 2020). Robotic Process Automation (RPA) is preconfigured software that automates repetitive tasks and processes based on rules. It requires low programming experience, low implementation costs, and a fast return on investment. RPA solutions are suitable for various processes and result in high efficiency gains. Intelligent Process Automation (IPA) uses emerging technologies like Artificial Intelligence (AI), Machine Learning (ML), and Natural Language Processing (NLP) to perform complex tasks like evaluation, reasoning, decision-making, and compliance with probabilistic or deterministic process requirements, evolving from simpler repetitive processes (Cascais Brás et al., 2023).

RPA can be combined with AI methods and algorithms, such as NLP, ML, Deep Learning (DL), and predictive analytics, to ease the transition to IPA (Siderska et al., 2023). The impact of machine intelligence on business processes is significant, specifically in the emerging paradigm of IPA. This emerging theme combines ML and AI to improve business process outcomes (Chakraborty et al., 2023). RPA vendors are experiencing stable growth, with the US and UK being the top markets globally. Asia-Pacific countries are also experiencing significant growth in RPA. RPA is in high demand across industries such as banking, healthcare, pharmaceuticals, telecommunications, and retail (Madakam et al., 2022). Table 1 lists potential RPA vendors, their clients, and the industries in which they operate globally. RPA technology is relatively new, with limited literature diversity.

Table 1: RPA vendors, clients, and Industry

Key Vendors	Key Clients	Source of Revenue By Industry
Automation Anywhere	Deloitte, Accenture, AT&T, GM, JPMorgan Chase	Banking, Financial Services, and Insurance (BFSI)
UiPath	Atos, AXA, BBC, Capgemini, CenturyLink, Cognizant, Middlesea, OpusCapita, SAP	BFSI, Healthcare, Telecom, Media, Retail and Consumer
Blue Prism	BNY Mellon, RWE npower, Telefonica O_2	BFSI, Health, Pharmaceutical, Retail and Consumer, Telecom and Media, Manufacturing, Public sector, Travel and Transportation
WorkFushion	Thomson Reuters, Infogroup, Citibank, Standard Bank	BFSI, Retail and Consumer
Thoughtonomy	Atos, Fujitsu, CGI, Unite BT, Business Systems	BFSI, Healthcare, Retail and Consumer, Telecom, Public sector
KOFAX	Arrow Electronics, Delta Dental of Colorado, Pitt Ohio, Audi	BFSI, Healthcare, Retail, Consumer, Telecom and Media, Manufacturing, Public sector, Travel, Transportation

The gap analysis was conducted by adding autonomous systems to RPAs to enable safe landings, prompting companies to explore innovative solutions such as IPA (Doguc, 2022). Therefore, there are potential vendors, such as Automation Anywhere, UiPath, and Blue Prism, that can provide RPA solutions globally. However, there are very few use cases in the telecommunications industry (Table 1). As shown in Table 1, there is insufficient evidence regarding IPA implementation in the telecommunications industry globally.

According to Sharma et al. (2023), low complexity, excellence, and pressure from industry/business partners significantly influence adoption of RPA. The scalability of a business process negatively influences adoption, while the capability of a process does not. Therefore, the potential of RPA for technology-driven and societal transformation should be encouraged to ensure proper adoption and implementation. AI breakthroughs have advanced cognitive tasks, leading to increased demand for IPA services. Cognitive algorithms can disrupt knowledge work, augment intelligence, and provide insights and innovation (Stoykova & Shakev, 2023).

Fabrocini (2021) contributes to understanding Disruptive Technologies (DT) enabled by AI and ML across various industries. He evaluates IPA and its impact on industrial management, discussing key AI and ML components and their applications in digital industries. Viswanadhapalli (2024) has conducted a study to integrate RPA with AI-enhanced RPA within Pega's IPA framework and highlights the benefits of AI-powered RPA in automating complex business operations across finance, healthcare, and e-commerce.

The research further highlights the strategic advantages of AI-powered RPA in digital transformation, including greater operational efficiency, reduced costs, and the ability to enable scalable, intelligent automation solutions. Technological advancements have led to the digitization of services and businesses, resulting in an era of automation. IPA combines RPA with AI to create autonomous processes (Patrício et al., 2024). Pega's AI-driven RPA is a paradigm change toward autonomous and cognitive automation, setting a new benchmark for enterprise-level process management. It is not merely a slight improvement over traditional RPA. One of the most promising and strategic technological options for driving a company's digital transformation is IPA (Lievano-Martínez et al., 2022). RPA transforms organizations by replacing human labour with intelligent software robots, enabling operational excellence, employee empowerment, and digital transformation across both commercial and non-commercial sectors (Kedziora & Hyrynsalmi, 2023).

AI has advanced to the point of outperforming humans in tasks like object detection and language translation. This has led to increased demand for IPA services. Cognitive algorithms can disrupt knowledge work, enhancing intelligence-decision-action cycles but also posing risks in uncertain situations. Next-generation knowledge systems will benefit from bridging human and AI (Richardson, 2020). IPA 2.0 leverages a Generative AI Framework to revolutionise businesses by combining advanced ML algorithms with domain-specific knowledge, enabling unprecedented scalability, accuracy, and efficiency (Mandvikar & Achanta, 2023).

RPA has advanced over the past decade, with the emergence of IPA, which uses AI and ML to improve business process outcomes. Robotics and IPA improve efficiency, reduce costs, and mitigate risks in businesses. However, their integration into the business continuity lifecycle remains unclear. Despite interest, there is limited information on the direct connection between these technologies in business continuity (J. Brás et al., 2023). IPA's disruptive potential is evident in the audit sector, where it offers a replicable framework for organisations looking to strengthen their business continuity initiatives through technology integration. The results offer guidance on using automation to improve operational resilience and have implications for companies navigating the ever-changing nexus of technology and audit procedures. Business continuity may be affected by process automation, though the relationship between business continuity and IPA remains poorly studied (J. C. Brás et al., 2024)

Taking all these factors into account, this study conducted a gap analysis through a systematic literature review (SLR) to address empirical, theoretical, methodological, and contextual gaps in the implementation of IPA worldwide in the telecommunications industry. The following research objectives were addressed during the gap analysis of adopting IPA in the telecommunications industry globally, and it can also be highlighted that there is a contextual gap in the Sri Lankan context.

1. To explore the current knowledge of the implementation of IPA in the global business context.
2. To identify empirical, theoretical, contextual and methodological gaps in the implementation of IPA in the telecommunications industry.

Methodology

Article selection process and methods

The study was conducted as a SLR, following the "Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA)" guidelines for selection, analysis, and reporting of the articles (Liberati et al., 2009). The review protocol, formulated according to PRISMA guidelines, including the article search method, search terms, inclusion criteria, analysis methods, and reporting structure, is shown in Table 2. Empirical articles were chosen for this SLR for their strong credibility and peer-review processes (Priyashantha, 2025).

Table 2: Review protocol followed in the present review

Article Selection Method	**PRISMA guidelines**
Search terms	"Intelligent Process Automation" or "IPA"
Article inclusion criteria	1. Year range: 2020–2025 2. Subject area: All subject areas in Lens.org 3. Language of article: English 4. Keywords inclusion: "Title" or "Abstract" or "Keywords" 5. Publication source type: Journal articles 6. Type of study: Empirical articles (Peer-reviewed) 7. Methodological quality: Articles followed both quantitative and qualitative methodologies
Analysis Method	PRISMA guidelines
Reporting Structure	PRISMA guidelines

"Intelligent Process Automation" and "IPA" were used as search terms on the Lens.org platform. PRISMA guidelines were followed in the analysis and reporting of data.

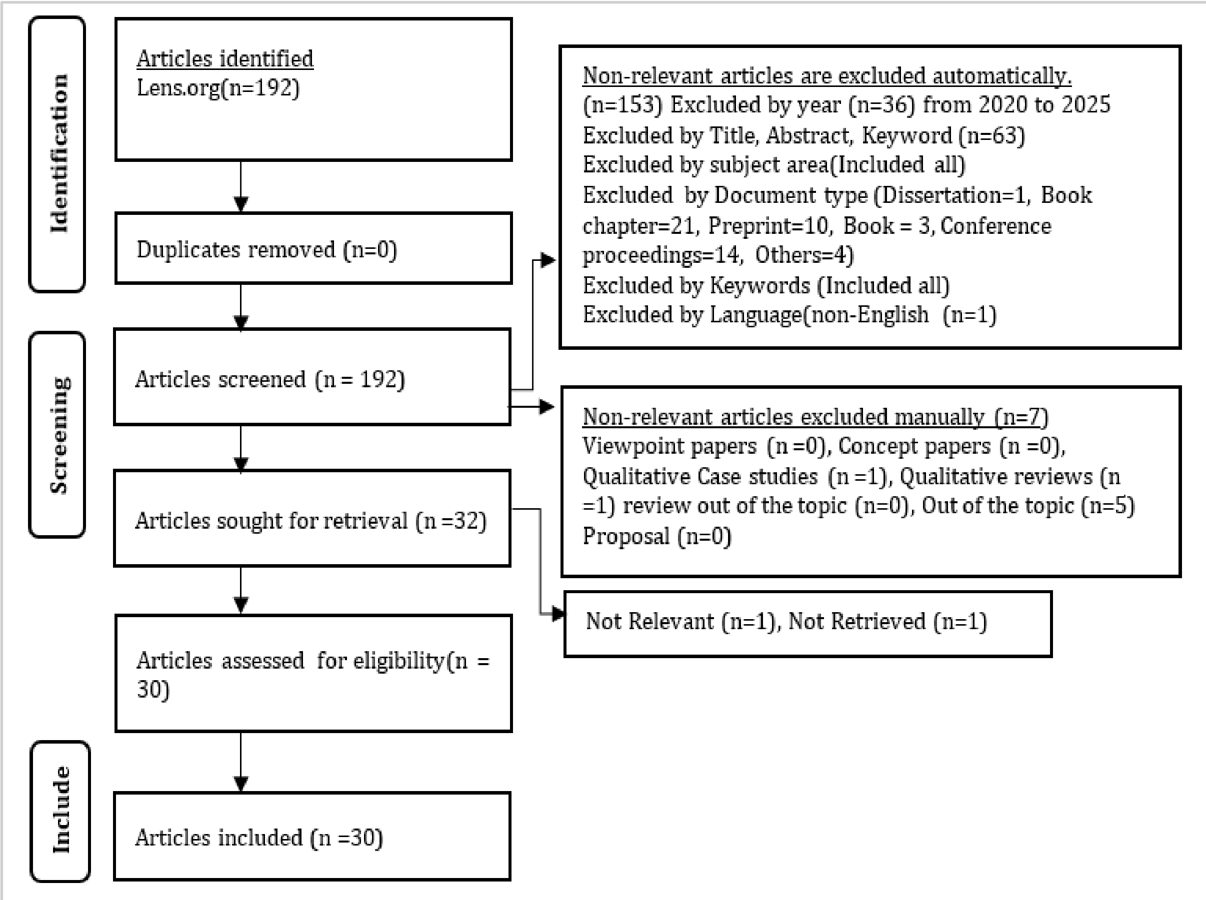

Figure 1. PRISMA flow diagram adopted in the present review

The articles were filtered for those published between 2020-2025 to capture the latest knowledge in the business world. Only articles published in English were selected, and the search terms were executed in “Title”, “Abstract”, and “Keywords” of the articles. Only peer-reviewed journal articles and empirical studies were selected to target the quality outcome, and both qualitative and quantitative studies were included due to the limited number of quantitative studies in this area (Priyashantha, 2026).

The PRISMA flow diagram has been developed according to PRISMA requirements and comprises four steps: “identification”, “screening”, “eligibility”, and “inclusion”. Figure 1 shows the four steps for the study. In the “identification,” the search terms were: “Intelligent Process Automation” or “IPA” in the title, abstract, or keywords in Lens.org. Automatic and manual screening were carried out against criteria one to five listed in Table 2 using the options in the databases. The articles that did not meet criteria one to five were excluded. After automatic screening, the remaining articles’ full versions were retrieved for manual screening and eligibility assessment. The articles were manually screened against the criteria in Table 2, items 6 and 7. VOSviewer, a scientific tool for visualising bibliometric analysis, was used for the bibliometric analysis, and keyword co-occurrence analysis was carried out to generate clusters for the study and bibliometric maps (van Eck & Waltman, 2014). Bibliometric analysis is a scientific method used to analyse scientific activity in a study, including evaluation, performance, and productivity analyses, as well as scientific maps created from article data, to provide a comprehensive understanding of the subject matter (Cobo et al., 2012). Additionally, "basic information about the article set," "year-by-year article publication," and "average citations received" were generated using the Biblioshiny package in RStudio (Priyashantha, 2023).

Methods to reduce the reviewer bias

A systematic procedure and unbiased quality assessment of articles by different researchers are recommended to minimize reviewer bias in article inclusion and analysis (Brereton et al., 2007). Review protocols, systematic and objective article selection techniques, analytic methods, and parallel independent appraisals by multiple researchers are necessary to eliminate bias in article selection and analysis (Xiao & Watson, 2019). In this regard, the present study employed a systematic review protocol, multiple independent reviewers for quality assessments, and a preliminary protocol for predetermined analysis procedures to mitigate analysis bias. These strategies aim to eliminate bias in both article selection and analysis (Priyashantha et al., 2024).

Results

VOSviewer version 1.6.20 was used to generate the keyword co-occurrence network shown in Figure 2. Keywords that appeared in the articles at least 3 times were considered for development. Eight keywords were generated, including the primary keyword, Intelligent Process Automation. Figure 2 shows the associations among those eight keywords. The line thickness in the figure indicates the strength of the relationship between keywords. The node's size indicates the frequency of occurrence.

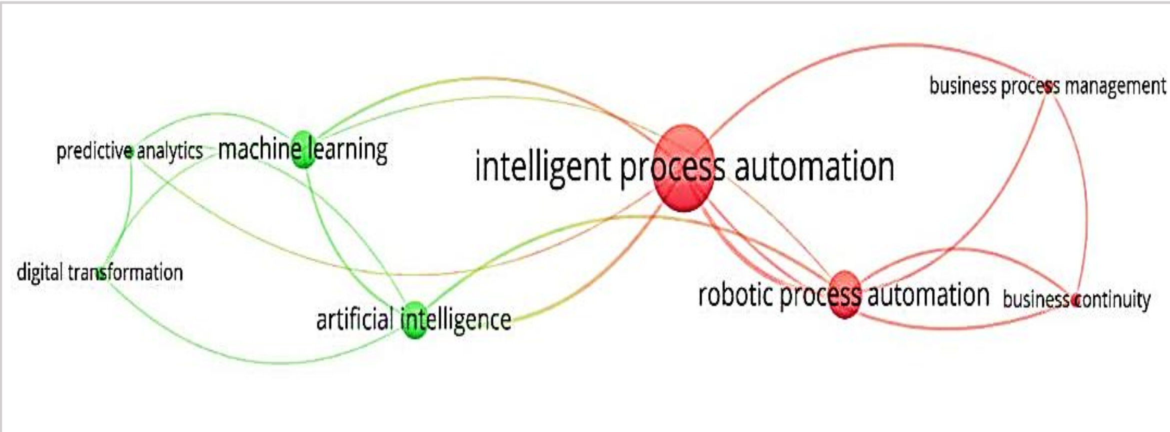

Figure 2. Network diagram of the keywords related to Intelligent Process Automation

Table 3 presents an overview of the 30 articles published between 2020 and 2025 across 27 journals, with 126 authors from 17 countries, indicating broader coverage and an annual growth rate of 51.57%.

Table 3: General information about the articles selected for the present review

Main information about the data	Results
Timespan	2020:2025
Sources (Journals, Books, etc.)	27
Documents	30
Annual Growth Rate %	51.57

References	729
Author's Keywords (DE)	142
Authors	126
Countries	17

The total references included 729 and included 142 author keywords. Figure 3 shows an increase in overall article publication, indicating that most studies were conducted in 2023. As shown in Figure 3, the research area shows an upward trend, with a nearly 52% growth rate.

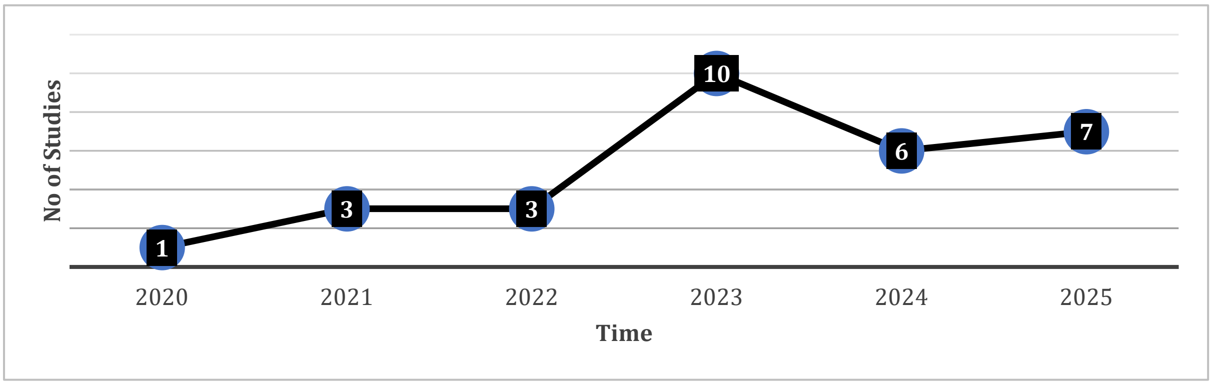

Figure 3. Number of publications related to Intelligent Process Automation (IPA) during 2020–2025

Figure 4 displays keyword co-occurrence density visualization, with keywords in red highlights indicating extensive research and sufficient knowledge, such as IPA. Keywords in green and yellow highlight areas of less research and knowledge, with two clusters created using these keywords (Priyashantha et al., 2022).

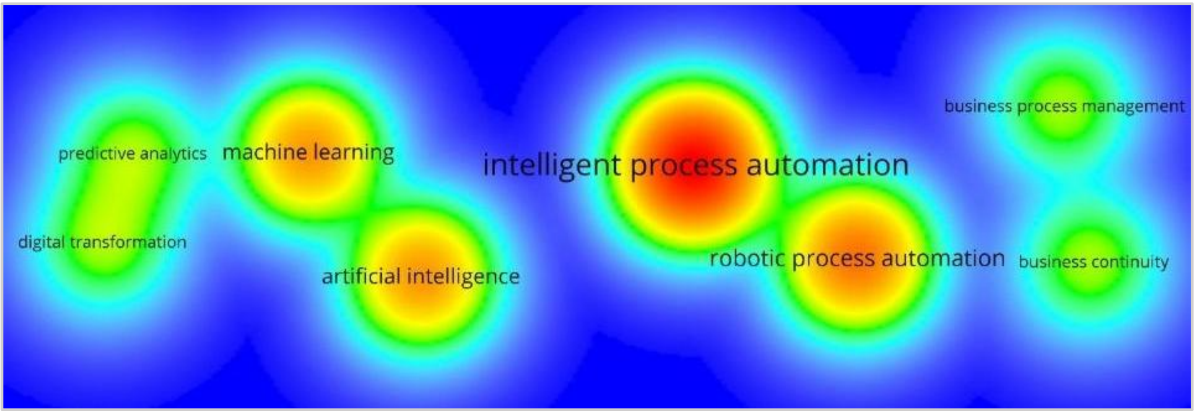

Figure 4. Visualization of the density of keywords related to Intelligent Process Automation (IPA)

According to Figure 4, the areas highlighted in yellow and green were identified as insufficient, indicating the need for further research. Overall, the map highlights the need for more research across the entire research area, given inconsistent connectivity among the highlighted areas.

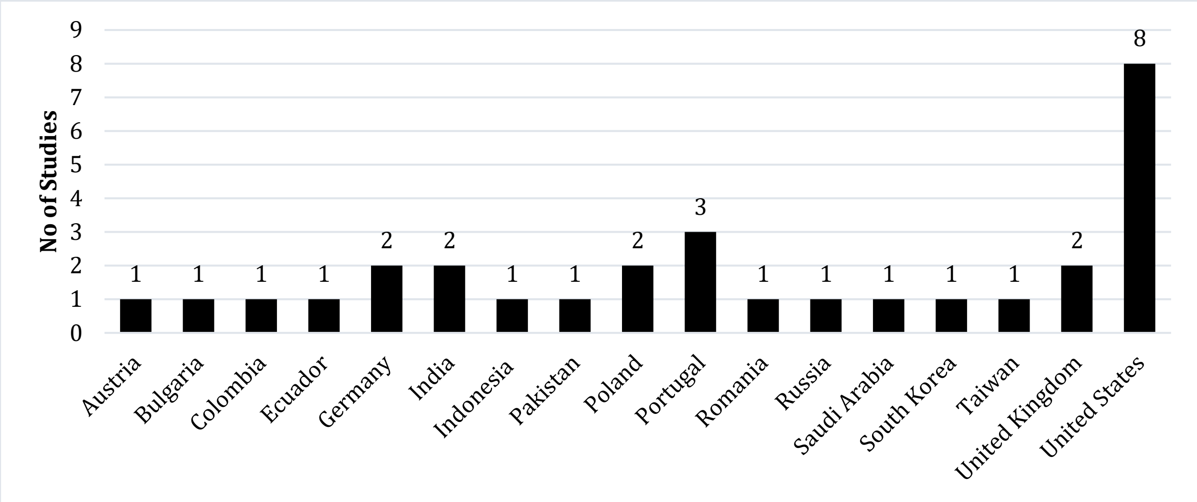

Figure 5. Country-wise IPA-related article production from 2020 to 2025

Figure 5 shows the production of articles by country. It shows that the majority of IPA-related articles, eight in all, were carried out in the United States of America, with Portugal coming in second with three and Germany, India, Poland and the United Kingdom in third with 2 studies each.

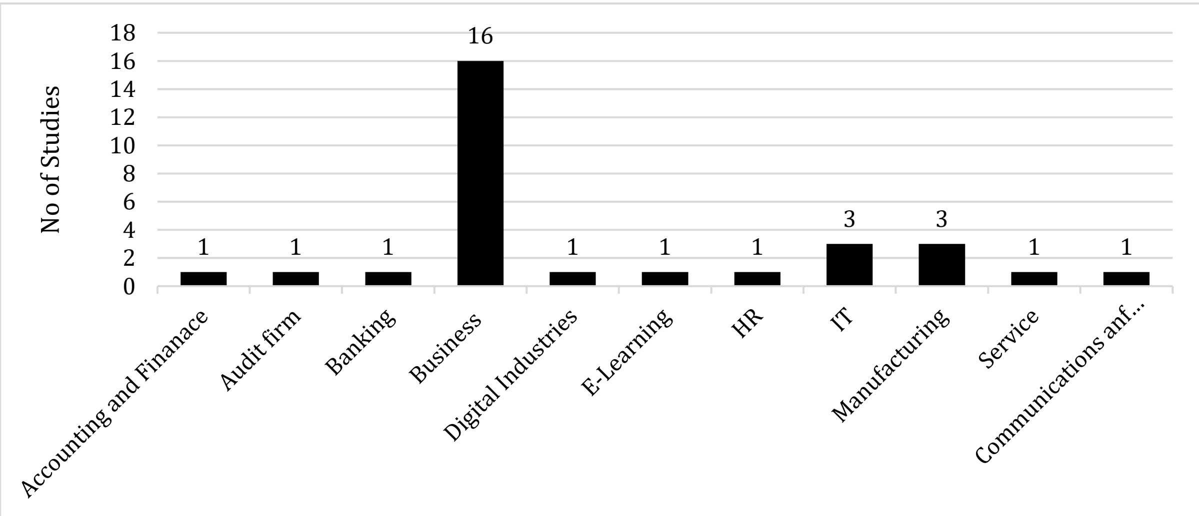

Figure 6. Industry-wise IPA-related article production from 2020 to 2025

The keyword 'IPA' was initially searched to target the entire business context, as no articles were found in the telecommunications industry. Therefore, an industry analysis was carried out, and the results are shown in Figure 6. According to the results, most analyses focused on the business context in general. Only one article on communication was fetched.

Table 4: Occurrence of keywords in articles

Minimum keyword occurrence	Threshold keyword level
1	145
2	15
3	8
4	4

Using the VOSviewer program, the minimum keyword occurrences functionality was examined, and threshold keywords ranging from 1 to 4 were recorded. To cover more keywords, the minimum occurrences of each keyword were raised from one to the threshold keyword level. Table 4 shows that one occurrence links with 145 keywords, followed by 15, 8, and 4 for occurrences 2, 3, and 4, respectively. Nothing changed when it increased the occurrence beyond five. Since only 4 threshold keywords were generated with the highest minimum keyword occurrence of 4, they were selected based on a minimum of 4 occurrences to identify the most common IPA areas. The threshold of three occurrences was set to understand the areas of study in the global business context. Table 5 presents the frequency of the eight keywords with at least 3 occurrences. The main keyword "Intelligent Process Automation" has 20 occurrences, followed by 11 for "Robotic Process Automation", 8 for "Artificial Intelligence", etc.

Table 5: Keywords with more than three occurrences

Keyword	Occurrences
Intelligent process automation	20
Robotic process automation	11
Artificial intelligence	8
Machine learning	8
Business continuity	3
Business process management	3
Predictive analytics	3
Digital transformation	3

Keywords across different clusters were grouped in VOSviewer based on their occurrence, indicating their connections and their belonging to a single phenomenon (Priyashantha et al., 2023). The VOS viewer detected eight terms in articles and connected them to lines based on frequency. These terms were categorised into two clusters: red and green, indicating relationships and common themes. These themes were identified by analysing each article's findings for similar characteristics.

Table 6: Cluster distribution among keywords

Colour	Theme	Keyword
R	Enhancing Business Continuity through IPA	Intelligent Process Automation, Robotic Process Automation, Business Process Automation, Business Continuity
G	Accelerating IPA through AI-Driven Predictive Transformation	Artificial intelligence, Machine learning, Predictive Analytics, Digital transformation

Table 6 presents the two clusters and their corresponding themes in the study. The theme in Red colour can be interpreted as business continuity using the evolution of process automation. According to the keywords in the red cluster, it is apparent that the evolution of process automation, viz., starting from BPA, then RPA, and ultimately IPA, is required for Business Continuity. The implementation and utilisation of IPA would be an order-winner for achieving competitive advantage and ensuring the successful continuation of the business. The theme in Green can be discussed in terms of the new acceleration enabled by AI and ML for predictive transformation. Now, the "Digital Transformation" is one of the most popular buzzwords in the industrial context, applied to both the public and private sectors. When implementing digital transformation, predictive analytics techniques powered by AI and ML are essential to success.

Figure 7 portrays a developing research landscape focused on technological integration and strategic transformation. Central motor themes such as digital transformation, predictive analytics, and cloud computing are prominent, underscoring their strong influence on the intellectual framework of the field. These themes serve as key strategic drivers, connecting infrastructure, data analytics, and organizational change. Meanwhile, foundational themes like AI and ML are highly central but low in density, indicating they are crucial yet conceptually fragmented. Niche themes such as IPA, RPA, and business continuity are well-established individually but remain less connected to broader research, reflecting specialized research paths. Conversely, themes of automation and cognitive automation lie in an emerging or declining state, pointing toward early development stages or shifts in terminology within AI contexts. Overall, the map highlights a migration from generic automation approaches to intelligent, analytics-driven, cloud-supported digital transformation, indicating the field's evolution towards more integrated, enterprise-wide strategic implementations and operational resilience.

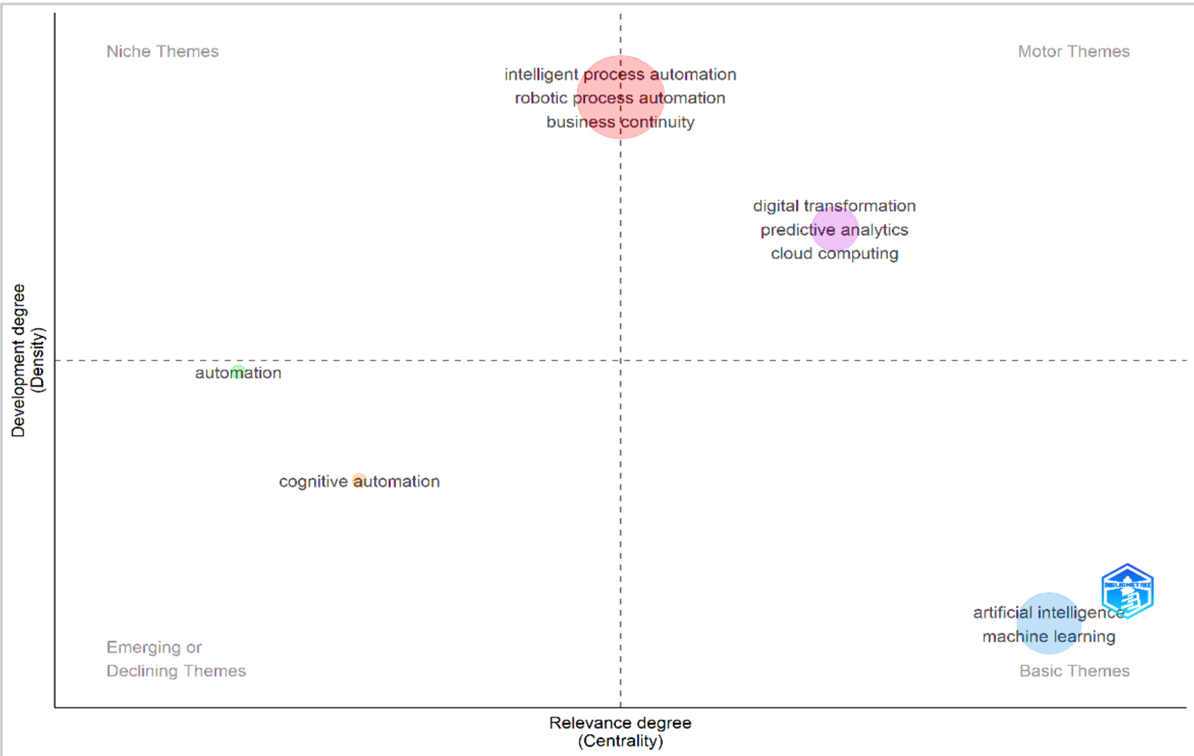

Figure 7. Thematic map generated through Biblioshiny by using identified keywords

Figure 8 shows the methodological analysis of 30 articles used in the SLR. According to the results, 80% of the analyses used the qualitative method, 10% used SLR, 7% used quantitative methods, and 3% used mixed methods combining both qualitative and quantitative methods. Most of the qualitative analysis contains concept and review papers, suggesting potential areas for further research. Few studies followed a case study approach and conducted gap analyses to identify areas for future work in IPA across different industries. One study has referred to multivocal literature review using grey literature. One study was identified through a scientific literature search using the Research Rabbit AI tool to recommend future research areas in this field. Few studies have developed frameworks and models for identifying potential business processes and validating them using real-world data. One quantitative study was found that tested the model with partial least squares structural equation modelling using Smart PLS. SPSS and AMOS tools were used to validate the model for other quantitative studies. Both primary and secondary data were used for the studies.

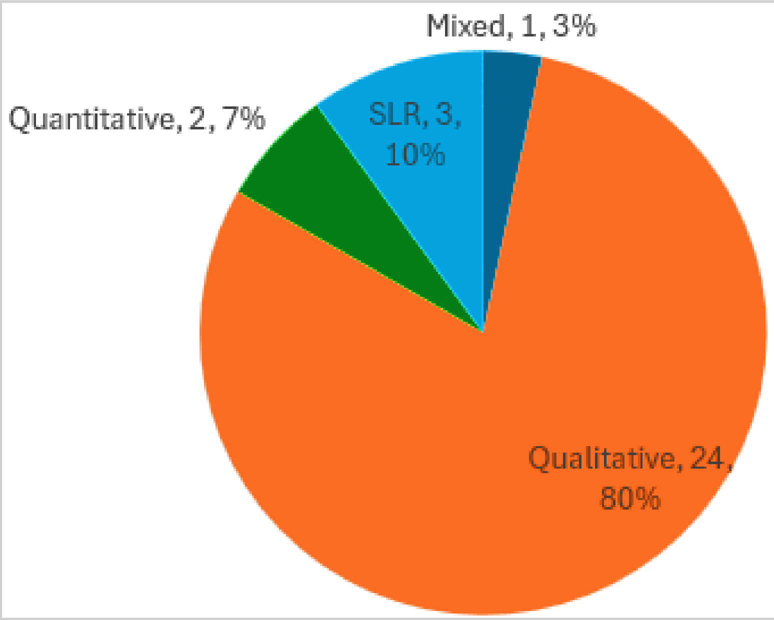

Figure 8. Distribution of research types in the selected articles related to IPA

The Unified Theory of Acceptance and Use of Technology (UTAUT) and the Extended UTAUT model have primarily been used to validate technology adoption through quantitative analyses in this context. However, it couldn't find the studies in the telecommunications industry.

Discussion

The present SLR was conducted following the PRISMA guidelines and the PRISMA-P checklist for article selection, identification, screening, eligibility, and inclusion criteria. The current knowledge on "Intelligent Process Automation" was evaluated by extracting 192 articles from lens.org. Finally, 30 articles were selected after applying the inclusion and exclusion criteria. The current knowledge was explored during the SLR.

The empirical, theoretical, contextual and methodological gaps in the field of IPA were investigated. It is strongly evident that a strong association exists among IPA, RPA, BPA and Business continuity. According to the thematic analysis, there are two distinct clusters with little association between them. There can be further investigation to establish the linkages between them, applying the latest technologies such as AI, ML and predictive analytics in the context of Digital Transformation.

These are essential for business continuity due to technological advancements, ever-changing business requirements, and customer expectations. Nevertheless, the link between emerging technologies such as AI, ML, and predictive analytics and the digital transformation is not as strong as indicated by the network diagram and the keyword density visualization of the selected articles. Although there are common themes across two separate clusters, a gap remains, as shown by the greater blue, green, and yellow areas in the density visualization. There is an empirical gap in the investigation of IPA adoption and implementation in a business context.

According to the country-wise article production from 2020 to 2025, no similar studies on IPA in businesses in Sri Lanka have been conducted. Therefore, it can be stated that there is a contextual gap in this research area, and it is encouraged to carry out such research in the Sri Lankan context. RPA is widely used in banking, healthcare, and manufacturing, enhancing operational efficiency and productivity (Pramod, 2022). In line with Pramod's (2022) findings, only one study was identified in the telecommunications industry globally, per the SLR protocol. Therefore, again, there is a gap in the telecommunications industry.

The UTAUT model has been used to investigate the reasons and areas for IPA adoption. Trust and transparency were found to be crucial for IPA adoption, and organizations should cultivate a positive attitude towards diffusion. The adoption of IPA depends on potential adopters' characteristics, such as experience and job level (Mayr et al., 2024).

The adoption of IPA was investigated by identifying 13 determinants and creating an extended UTAUT model. The Knowledge-Based View and Transaction Cost Theory were used to examine the moderating effect of Not-Invented-Here Syndrome (NIHS) on digital orientation and innovation performance (Arias-Perez et al., 2017). The mediating effect of employee AI awareness on the relationship between AI-generated technological turbulence and knowledge hiding. shows that employees are willing to hide knowledge when they perceive it as a threat to their jobs, leading to opportunistic behaviors (Arias-Pérez & Vélez-Jaramillo, 2022).

The majority (80%) of analyses used qualitative methods, such as case studies, concept papers, comparative studies, and review papers. Only 3% of the studies have referred to quantitative methods. Hence, the methodological gap can be addressed for further analysis through a deductive approach, using theories to validate and develop a model or framework. Only five theories, viz. Diffusion of Innovation Theory, UTAUT, the Extended UTAUT model, the Knowledge-based view, and Transaction Cost Theory have been tested in quantitative analyses. There are additional theories to evaluate in technology adoption beyond the mentioned theories, indicating a theoretical gap in the area of study. New knowledge can be introduced, even by appropriately combining two models to formulate the research's conceptual framework.

Theoretical and practical implications

AI, including ML and RPA, is integrated to support human-centric jobs and increase efficiency, with an emphasis on IPA. It discusses the challenges of implementing disruptive Technologies powered by AI and ML, offering insights for industries seeking to enhance their AI and ML management and optimization. As the argument goes, IPA can be used to reduce operational costs, enhance efficiency, focus on more cognitive business processes, and gain a competitive advantage.

Limitations and future research directions

Due to the contextual gap highlighted in this SLR, there is no clear evidence of studies on IPA in the Sri Lankan context. Therefore, empirical studies in the telecommunication industry to evaluate the impact of adopting IPA in Sri Lanka must be conducted. Lens.org was used in this study to explore knowledge because of limited access to high-impact databases such as Scopus and Web of Science. The quality of the journal articles reviewed, and the scope of the review were constrained by this factor. The Google Scholar search engine was not used for data exploration, as the goal was high-quality output.

Pramod (2022) suggests exploring opportunities in domains beyond banking, healthcare, and manufacturing to enhance operational efficiency and productivity. Waduge et al. (2024) suggest future research on IPA adoption, based on a literature review and expert opinion, emphasizing accuracy, human involvement, standardization, digital data input, integration, and technology cost. The article explores the intelligent automation of financial and accounting processes in Poland's BPO market, revealing a shift towards AI-powered RPA solutions to optimize costs, increase service speed, and enhance service quality, highlighting the importance of future research (Szortyka, 2024).

The study explored the challenges companies face in transitioning from RPA to IPA, identified AI techniques and algorithms, and provided insights for future research (Siderska et al., 2023). Based on the insight from the paragraph and the SLR's outcomes, the highlighted suggestions can serve as future research areas.

Conclusion

This SLR provides a comprehensive overview of current research on IPA and identifies significant empirical, theoretical, methodological, and contextual gaps that warrant further investigation. The findings highlight the growing importance of IPA in enabling digital transformation and business continuity. The review also demonstrates the need for more quantitative, theory-driven studies, particularly in underexplored industries such as telecommunications and in developing-country contexts, such as Sri Lanka. Addressing these gaps will contribute to a deeper understanding of the factors influencing IPA adoption and implementation and support the development of robust conceptual and practical frameworks.

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Conflict of interest statement

The authors declare that there are no conflicts of interest.

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